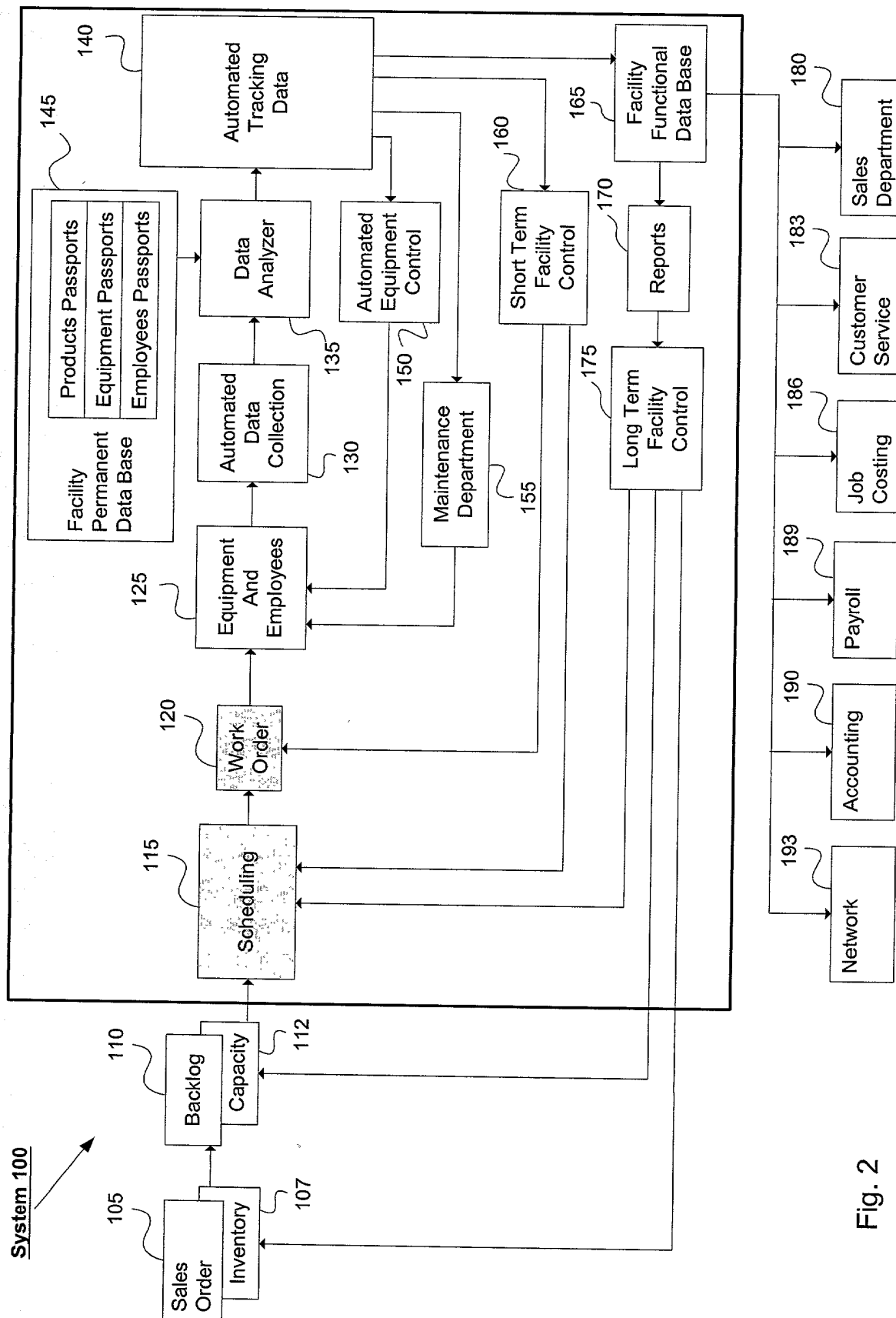


Fig. 1



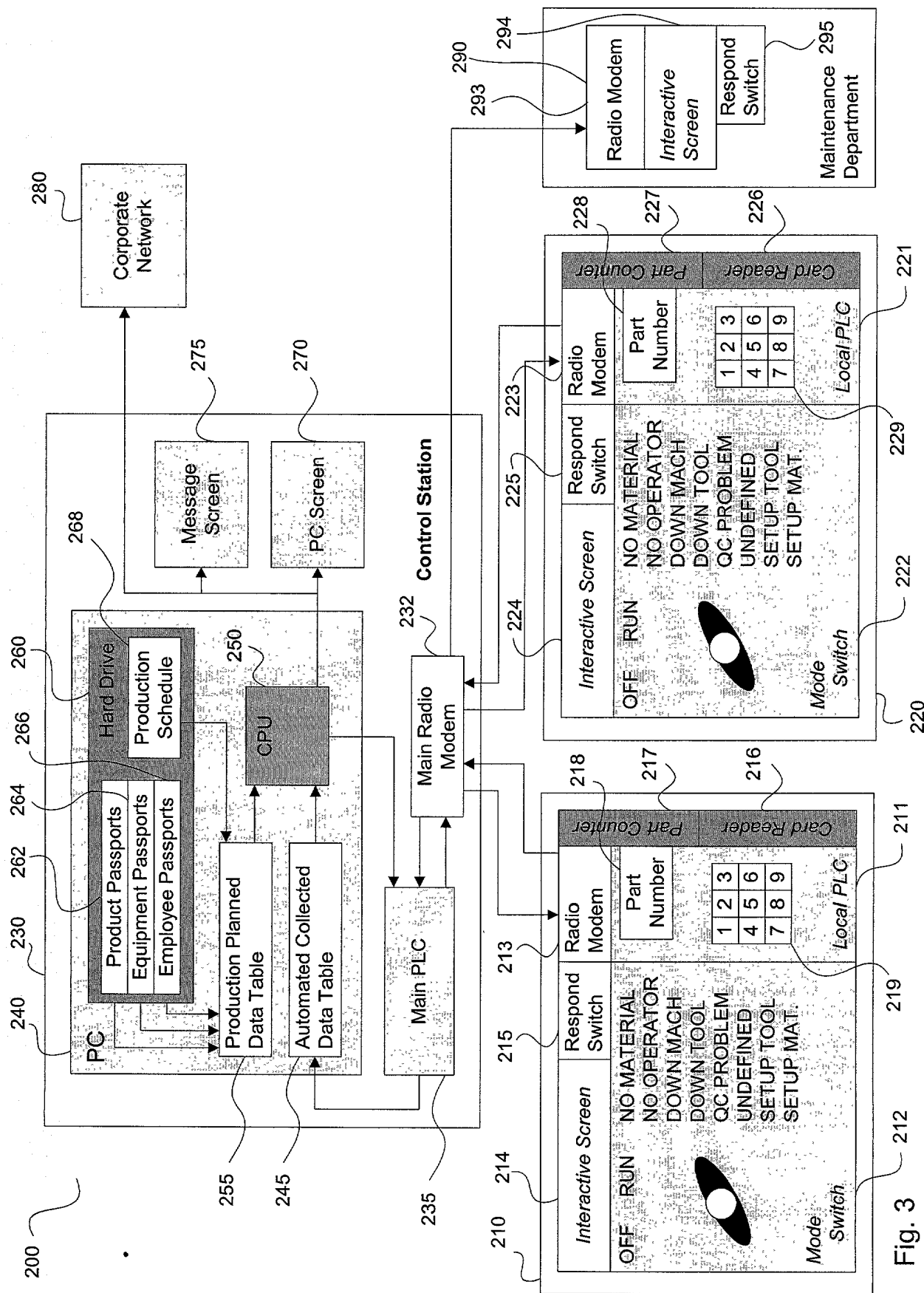


Fig. 3

FIG. 4 is a block diagram of a system architecture for a shop floor equipment monitoring system. The system includes a Main PLC (235) connected to a Main Radio Modem (232) via an RS232 Interface (233). The Main PLC (235) has INPUT, OUTPUT, and ETHERNET ports. The Main Radio Modem (232) is connected to a Network (280) via a Buffer Switch (720). The Main PLC (235) is also connected to a PC (260) via a COM1 (COM2) RS232 (RS485) connection (255). The PC (260) includes a Hard Drive (262) with Products Passports (264), Equipment Passports (266), and Employees Passports (268). The PC (260) also includes a CPU (240), a Production Schedule (245), a Production Planned Data Table (250), and an Automated Collection Data Table (230). The PC (260) is connected to a Message Screen (275) and a PC Screen (270). The Main PLC (235) is connected to a Local PLC (211) via an RS232 Interface (217). The Local PLC (211) is connected to a Radio Modem (213) via an RS232 Interface (216). The Local PLC (211) is also connected to a Card Reader (216), a Counter #3 (701), a Counter #2 (702), and a Counter #1 (703). The Local PLC (211) is connected to a Material Presents Detector (707), an Operator Presents Detector (708), a Machine Fault Detector (709), and a Downtime Detector (710). The Local PLC (211) is connected to a Shop Floor Equipment (210) which includes a Counter Sensor #2 (704), a Counter Sensor #1 (705), and a Material Presents Detector (707). The Shop Floor Equipment (210) is connected to a Lock-following Strobing Station (212) which includes a Mode Switch (212), a Respond Switch (215), and an Interactive Screen (214). The Shop Floor Equipment (210) is also connected to a Maintenance Department (290) which includes a Radio Modem (293), an Interactive Screen (294), and a Respond Switch (295).

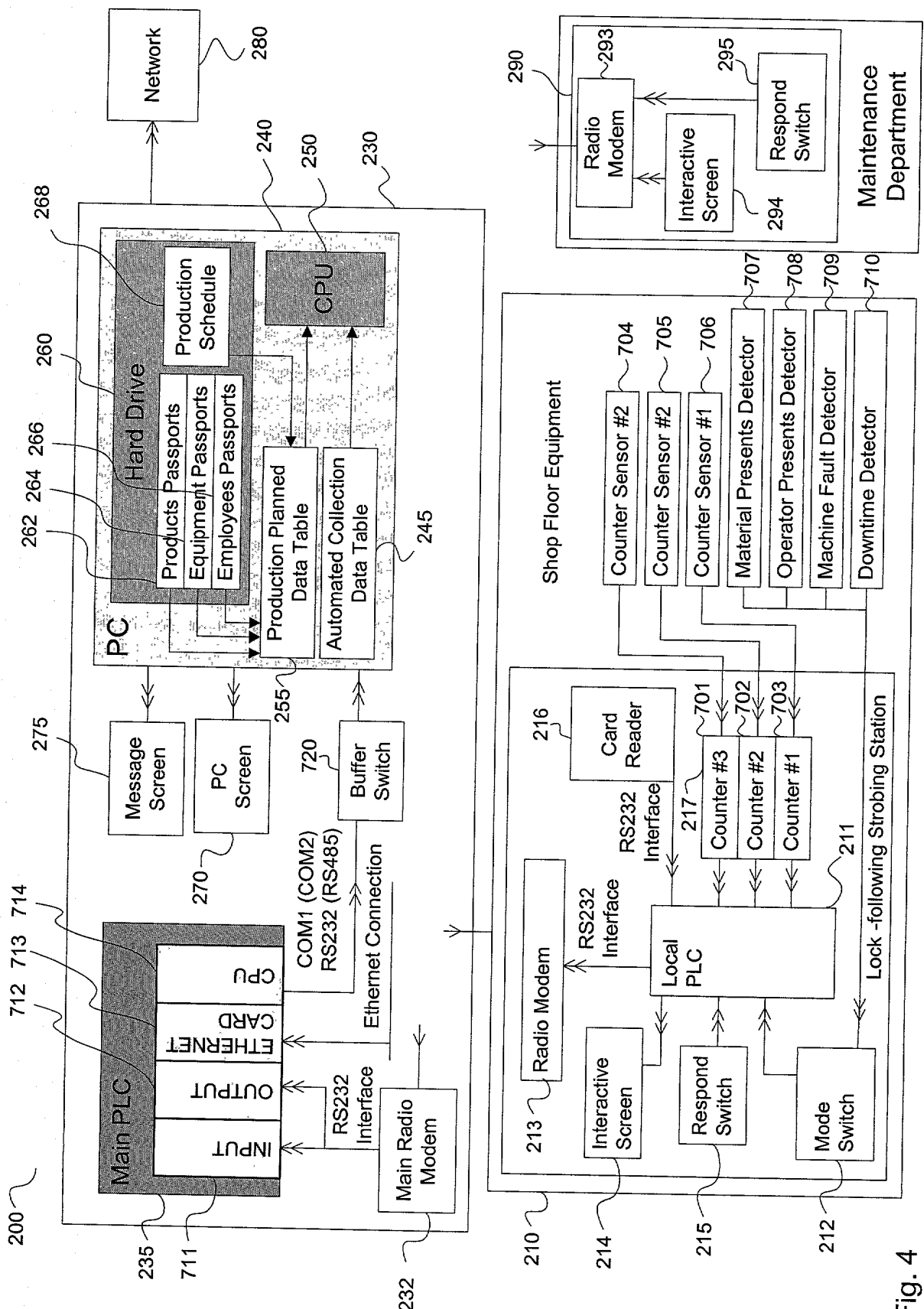


Fig. 4

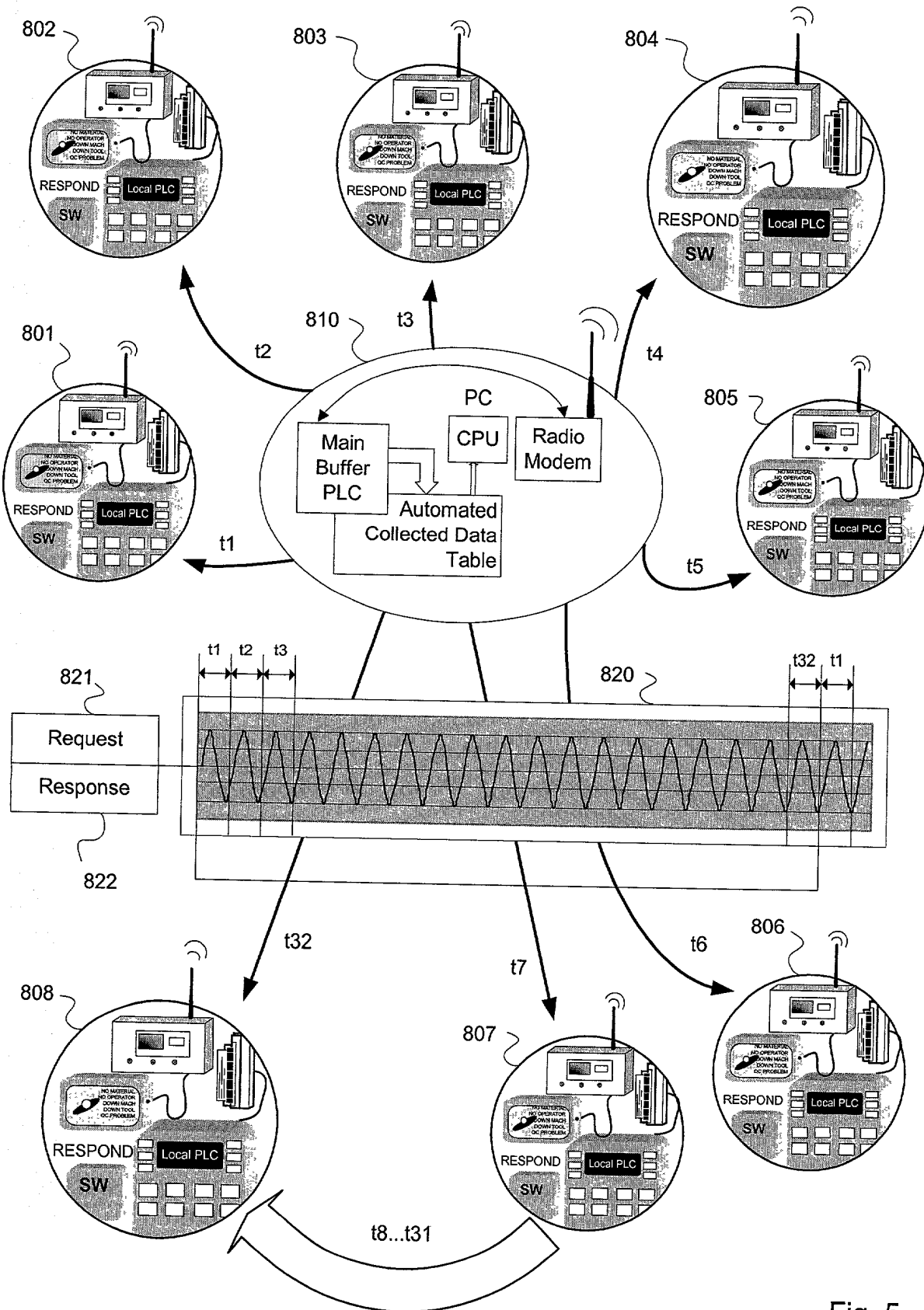


Fig. 5

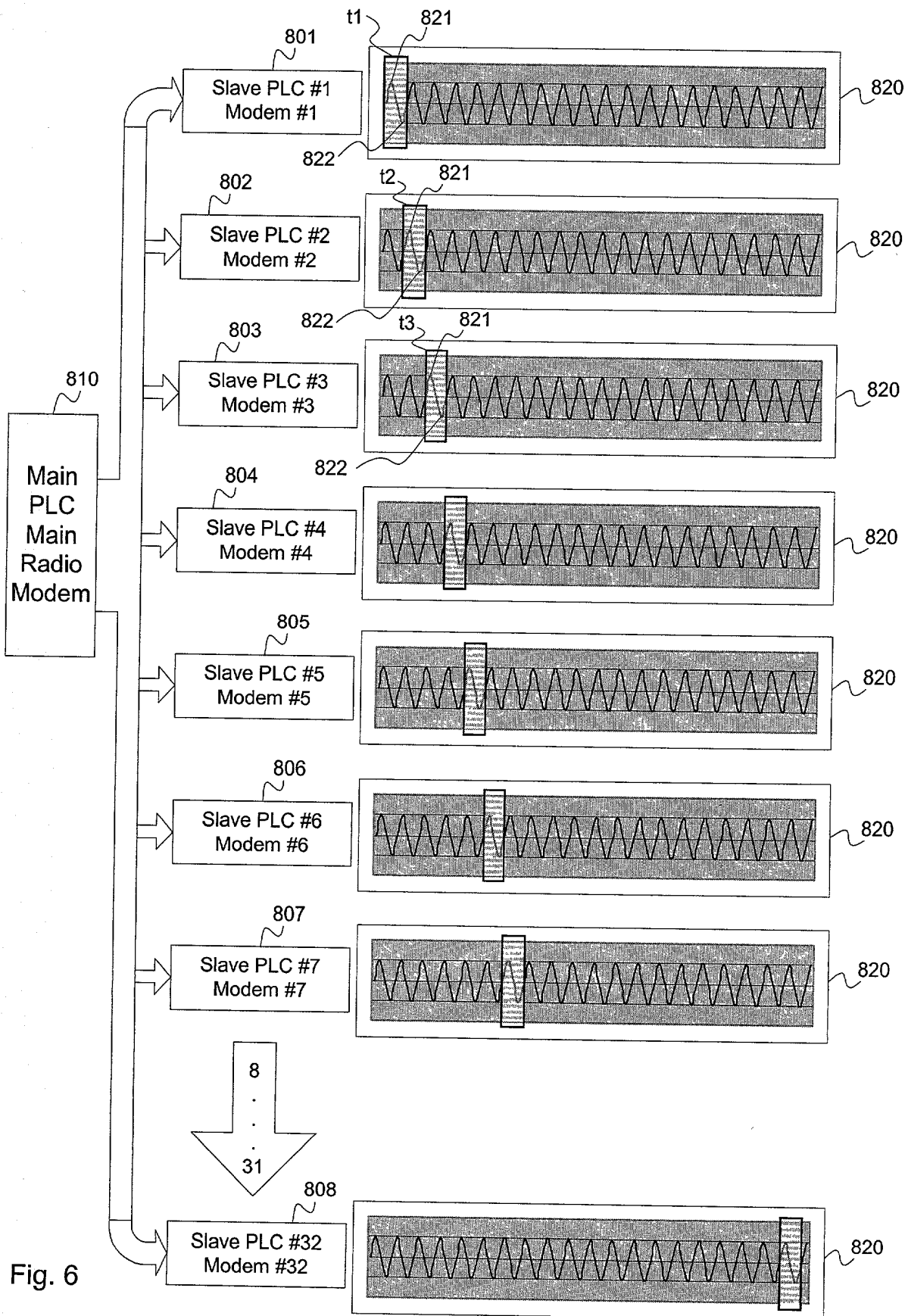



Fig. 6

ABC Corporation		Employee Passwords						
Plant	Employee	Period	Sort	Edit	New	Conv	Delete	Print
310								
301								
302								
303								
304								

ID	Name	Division	Position	Hourly Rate	Date of Hire	Seniority
20356	Bob G Smith	Machining	Operator	7.25	10/23/99	3
20357	Tom Parker	Machining	Line Lieder	10.50	03/04/98	5
20358	Jim Fagle	Machining	Onerator	8.50	05/06/98	4
20359	Bill Carter	Machining	Operator	6.00	10/01/01	1

Details			
ID	20358	Hourly Rate	8.50
Name	Jim Fagle	Date of Hire	05/06/98
Division	Machining	Seniority	4
Position	Onerator		
Description	Needs close supervision		



Fi. 8

ABC Corporation

Equipment

Period

Sort

Edit

New

Conv

Delete

Print

ID

Name

Number

Division

Operation

Available Time

Depreciation

Date of New

Complexity

Post

90356	Lathe	#1	Machining	OD	470	7.25	10/23/79	3	2
90357	CNC Mill	#2	Machining	Base	450	10.50	03/04/68	5	4
90358	CNC Mill	#6	Machining	Inside	450	8.50	05/06/98	4	8
90359	Drill Press	#12	Machining	Holes	480	6.00	10/01/66	1	6

Details

ID

90358

Depreciation

8.50

Name

CNC Mill

Date of New

05/06/98

Division

Machining

Complexity

4

Operation

Inside

Post Number

8

Available Time

450

Description

VMC Haas 20x30x25

OK

Cancel

320 Fig. 9

ABC Corporation

Plant	Part Number	Period	Sort	Edit	New	Conv	Delete	Print
ID	Name	Number	Division	#Operations	Production Time	Labor Cost	Assemble Number	
331	000001	Piston	EN203	Machining#1	5	120	9.20	EN001
332	000002	Cylinder	EN406	Machining#1	4	050	4.30	EN001
333	000003	Arm	DX123	Machining#2	4	044	4.35	DX005
334	000004	Shaft	DX432	Machining#2	6	102	8.70	DX005

Details

ID:

Name:

Division:

#Operations:

Description:

Production Time:

Labor Cost:

Assemble Number:

Operations Enter:

Fig. 10

ARC Corporation

Part: DX005 - Arm

Edit

Delete

Print

333

310

ID	Name	Number	Division	Equipment	Production Time	Labor Cost	Post
0001	Cut off	010	Ship.- Receiv.	Saw #1	5	0.62	no
0002	Milling	020	Machining #2	Vert.Mill #4	23	3.45	3
0003	Drilling	030	Machining #2	Drill Press #2	12	1.70	5
0004	Deburring	040	Machining #2	Table #5	4	0.58	9

341

342

343

344

Details

ID

0003

Equipment

Drill Press #2

Name

Drilling

Production Time

12

Number

030

Labor Cost

1.70

Division

Machining #2

Post Number

5

Description

Drill 28 holes Dia 0.38"

OK

Cancel

340

Fig. 11

Table Format Schedule 350

ABC Enterprises Scheduling

351 FIRST SHIFT

04/24/01 04/25/01 04/26/01 04/27/01 04/28/01 4/24-4/28

	Monday		Tuesday		Wednesday		Thursday		Friday		TOTAL PER WEEK	
	Type	Quan.	Type	Quan.	Type	Quan.	Type	Quan.	Type	Quan.	Type	Quan.
361 Press Line	PR33	1250	PR33	1250	PR33	1250	PR33	1250	PR33	1250	PR33	6250
362 Weld Line	XE42	1250	XE42	1250	XE42	1250	XE42	1250	XE42	1250	XE42	6250
363 Trim Line	PL2	1250	PL2	1250	PL2	1250	PL2	1250	PL2	1250	PL2	6250
364 Paint Line	F6U3	1250	F6P2	1250	F2Y7	1250	R1B1	1250	B6W2	1250	B6W2	6250
365 Packaging Line	F6U3	1250	F6P2	1250	F2Y7	1250	R1B1	1250	B6W2	1250	B6W2	6250

352 SECOND SHIFT

04/24/01 04/25/01 04/26/01 04/27/01 04/28/01 4/24-4/28

	Monday		Tuesday		Wednesday		Thursday		Friday		TOTAL PER WEEK	
	Type	Quan.	Type	Quan.	Type	Quan.	Type	Quan.	Type	Quan.	Type	Quan.
361 Press Line	PR33	1250	PR33	1250	PR33	1250	PR33	1250	PR33	1250	PR33	6250
362 Weld Line	XE42	1250	XE42	1250	XE42	1250	XE42	1250	XE42	1250	XE42	6250
363 Trim Line	PL2	1250	PL2	1250	PL2	1250	PL2	1250	PL2	1250	PL2	6250
364 Paint Line	F6U3	1250	F6P2	1250	F2Y7	1250	R1B1	1250	B6W2	1250	B6W2	6250
365 Packaging Line	F6U3	1250	F6P2	1250	F2Y7	1250	R1B1	1250	B6W2	1250	B6W2	6250

Fig. 12

ABC Enterprises Product Flow Tracking

400

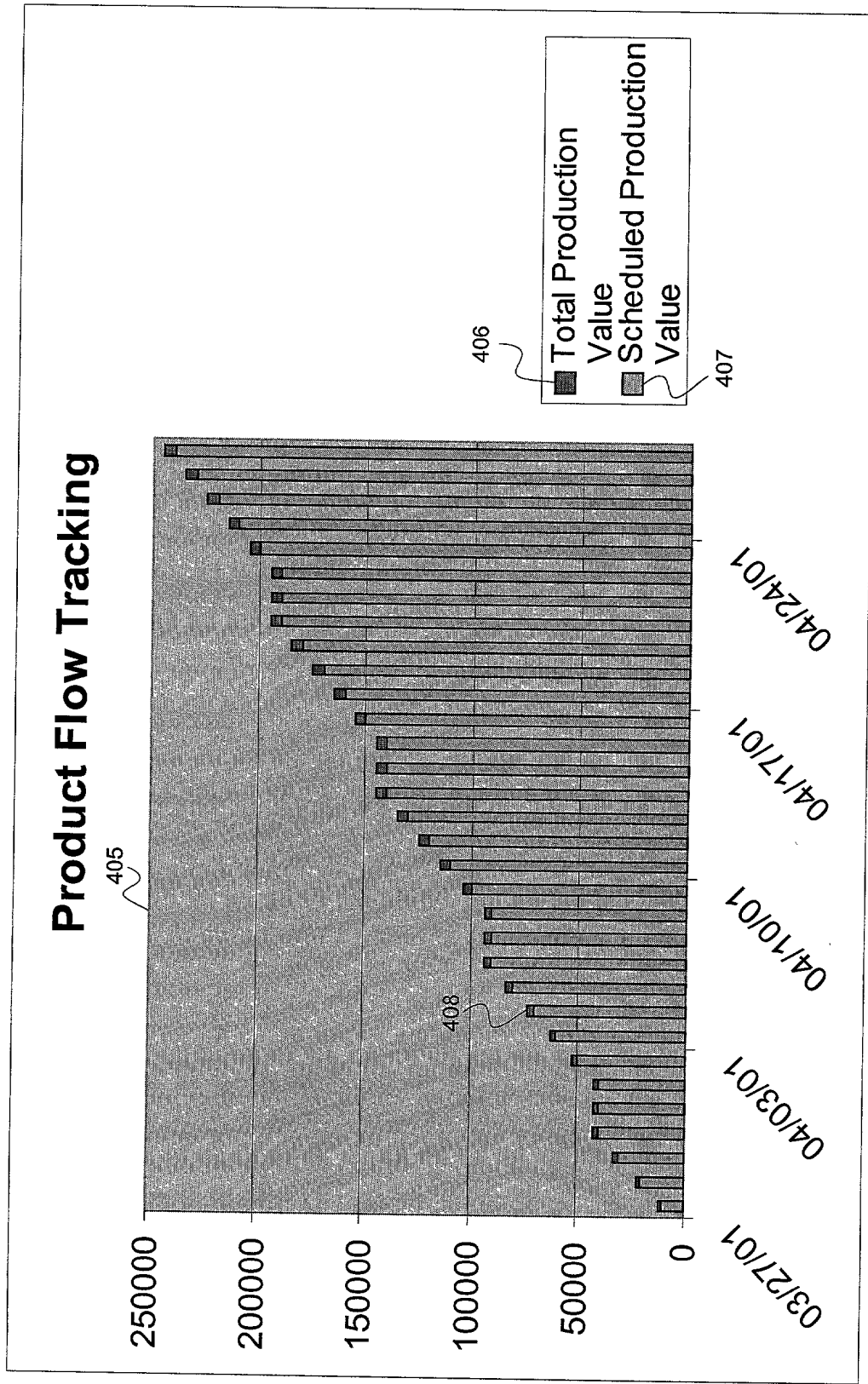


Fig. 13a

ABC Enterprises Product Flow Tracking

date	day	daily production value	total production value	scheduled production value	percent manufactured
03/27/01	tue	8500	8500	10000	85%
03/28/01	wed	10000	18500	20000	93%
03/29/01	thur	9100	27600	30000	92%
03/30/01	fri	10000	37600	40000	94%
03/31/01	sat	0	37600	40000	94%
04/01/01	sun	0	37600	40000	94%
04/02/01	mon	10000	47600	50000	95%
04/03/01	tue	10000	57600	60000	96%
04/04/01	wed	9000	66600	70000	95%
04/05/01	thur	10000	76600	80000	96%
04/06/01	fri	10000	86600	90000	96%
04/07/01	sat	0	86600	90000	96%
04/08/01	sun	0	86600	90000	96%
04/09/01	mon	10000	96600	100000	97%
04/10/01	tue	9100	105700	110000	96%
04/11/01	wed	10000	115700	120000	96%
04/12/01	thur	9510	125210	130000	96%
04/13/01	fri	10000	135210	140000	97%
04/14/01	sat	0	135210	140000	97%
04/15/01	sun	0	135210	140000	97%
04/16/01	mon	10000	145210	150000	97%
04/17/01	tue	10000	155210	160000	97%
04/18/01	wed	9800	165010	170000	97%
04/19/01	thur	10000	175010	180000	97%
04/20/01	fri	10000	185010	190000	97%
04/21/01	sat	0	185010	190000	97%
04/22/01	sun	0	185010	190000	97%
04/23/01	mon	10000	195010	200000	98%
04/24/01	tue	9850	204860	210000	98%
04/25/01	wed	9853	214713	220000	98%
04/26/01	thur	10000	224713	230000	98%
04/27/01	fri	10000	234713	240000	98%
					410
					412
					414
					415
					416
					417
					418

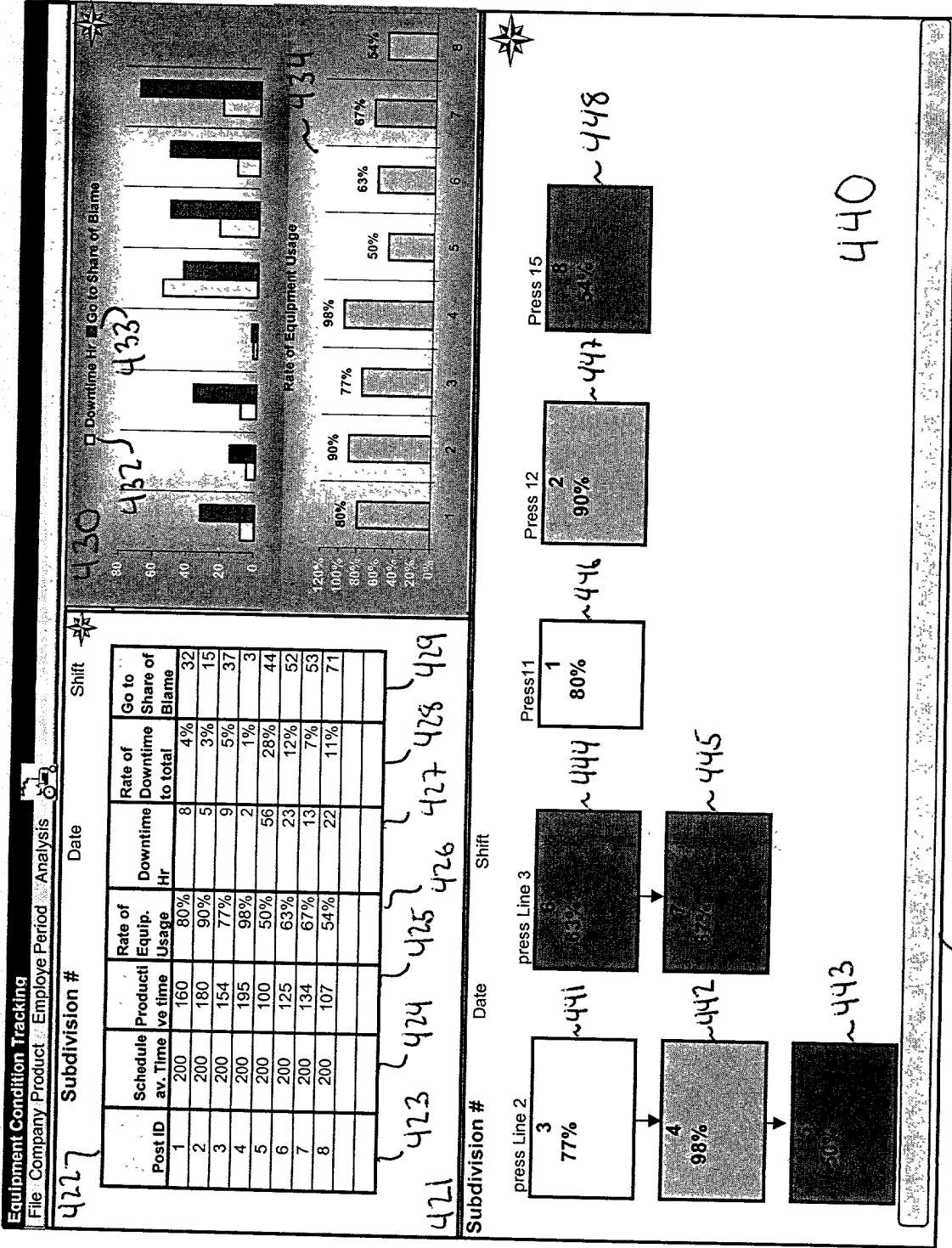


Fig. 14

4507

ABC Enterprises Manufacturing Efficiency and Costing

File Company View Product Employees Period Analysis



Subdivision	Scheduled efficiency	Actual efficiency	Percent efficiency
Press Line	.21 man hour / part	.27 man hour / part	-29%
Weld Line	.25 man hour / part	.32 man hour / part	-28%
Trim Line	.25 man hour / part	.22 man hour / part	12%
Paint Line	.15 man hour / part	.19 man hour / part	-26%
Assembly Line	.30 man hour / part	.28 man hour / part	7%
Package Line	.20 man hour / part	.18 man hour / part	10%

4517

4512

4513

4514

4515

Fig. 15a

ABC Enterprises Manufacturing Efficiency and Costing

File Company View Product Employees Period Analysis



Subdivision

Percent efficiency

Package Line

Assembly Line

Paint Line

Trim Line

Weld Line

Press Line

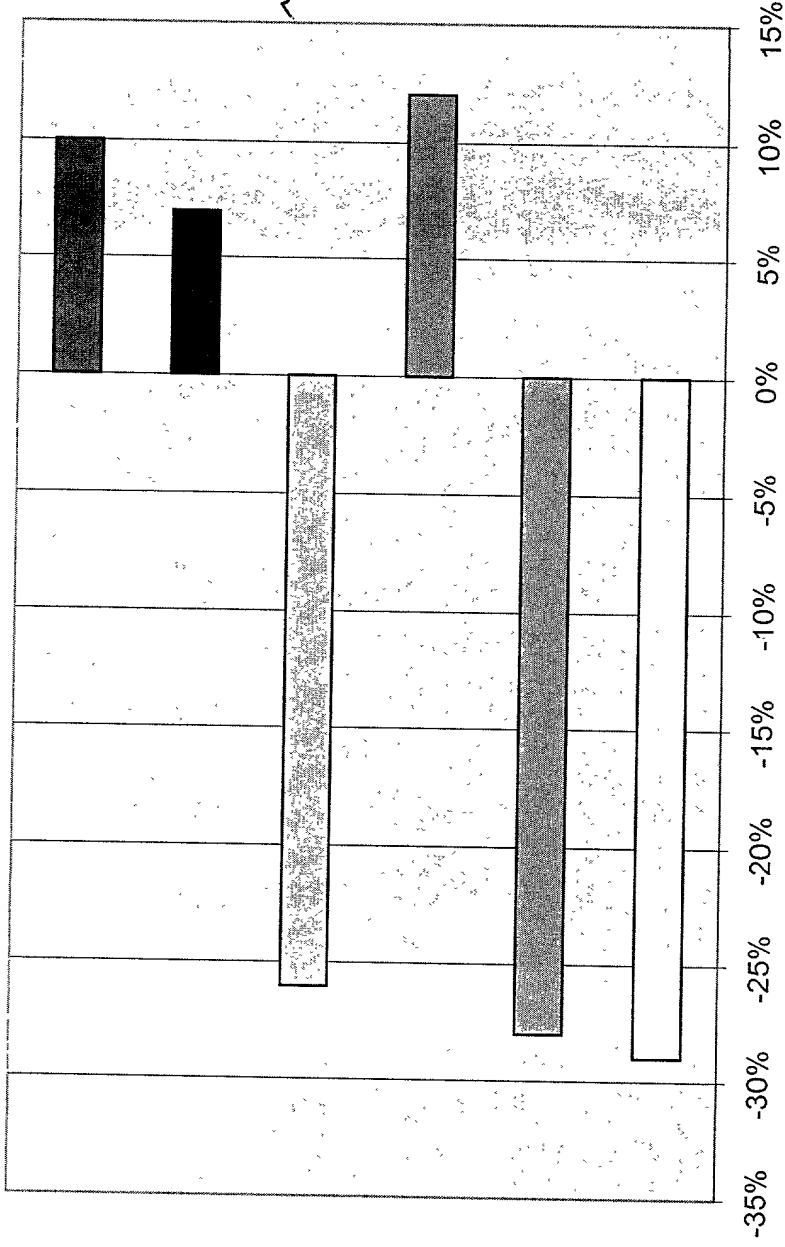


Fig. 15b

ABC Enterprises Manufacturing Efficiency and Costing

File Company View Product Employees Period Analysis

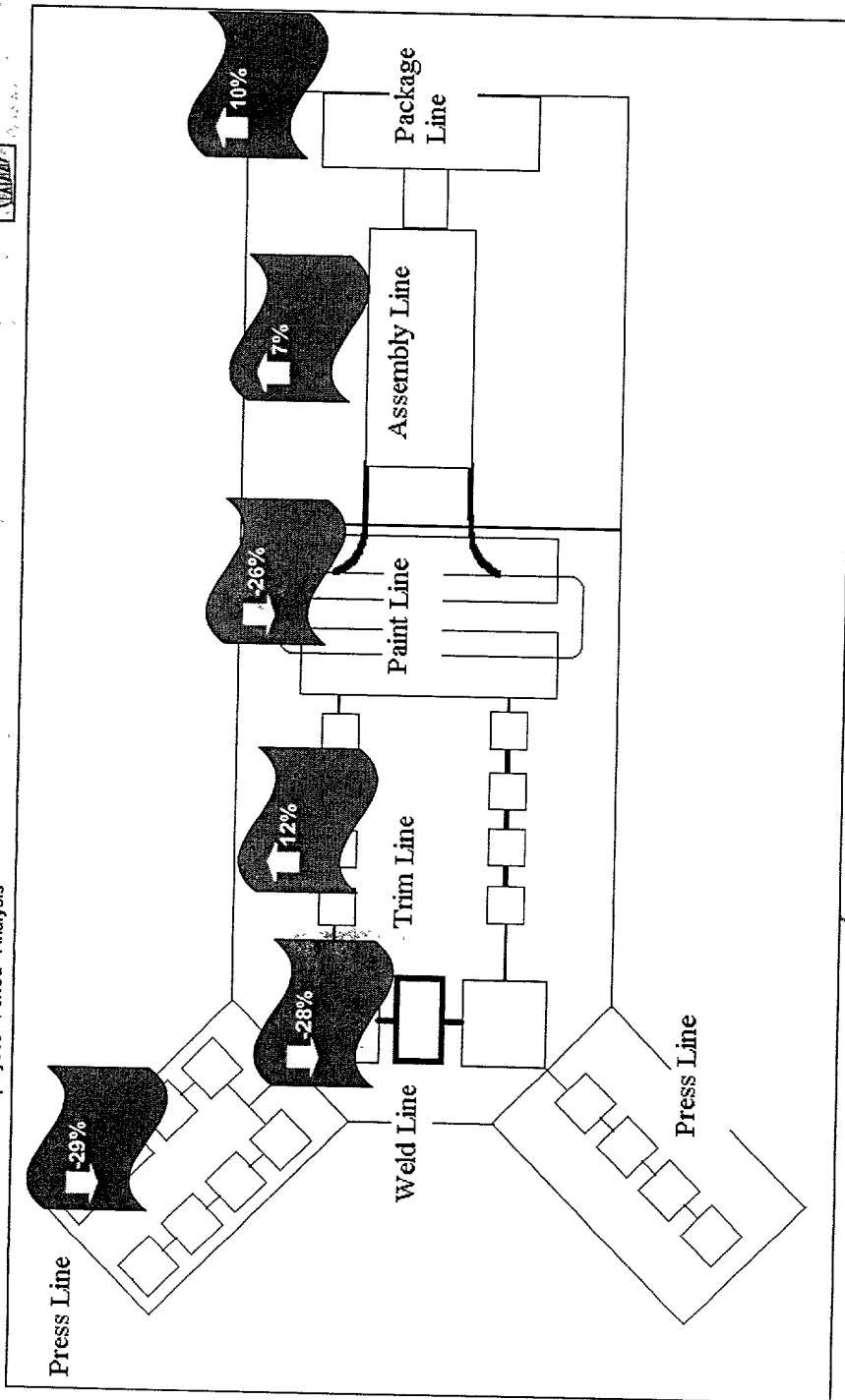


Fig. 15c

070

Employees Utilization and Performance Tracking

File Company Product Employee Period Analysis

Subdivision #

Date

Shift

Employee	Post #	Total Time	Active time	Inactive time	Efficiency
John	101	5:36	4:46	0:50	99%
Mary	102	5:34	5:04	0:30	97%
Kathy	103	5:05	3:25	1:40	95%
Jack	104	5:51	5:35	0:16	101%
Sally	105	2:55	2:40	0:15	105%
Bob	106	6:07	5:17	0:50	76%
Jim	110	5:29	4:48	0:41	82%
Ali-Baba	111	5:44	5:32	0:12	104%
Tom	112	5:36	4:46	0:50	79%
Bo	113	5:34	5:04	0:30	97%
Kit	114	5:05	3:26	1:39	95%
Ron	115	5:51	5:36	0:15	101%
Nick	116	2:55	2:40	0:15	105%
Alex	120	6:07	5:17	0:50	76%
Jay	121	5:29	4:48	0:41	82%
Stive	122	5:44	5:32	0:12	104%
Joe	123	5:29	4:48	0:41	82%
Baba	124	5:44	5:32	0:12	104%
Bill	125	5:36	4:46	0:50	79%
Boss	126	5:34	5:04	0:30	97%
Tim	127	5:05	3:26	1:39	95%

481

487

486

485

484

483

482

Fig. 16a

482

Employees Utilization and Performance Tracking

File Compa Product-Employ Period Analysis

Subdivision # Date Shift

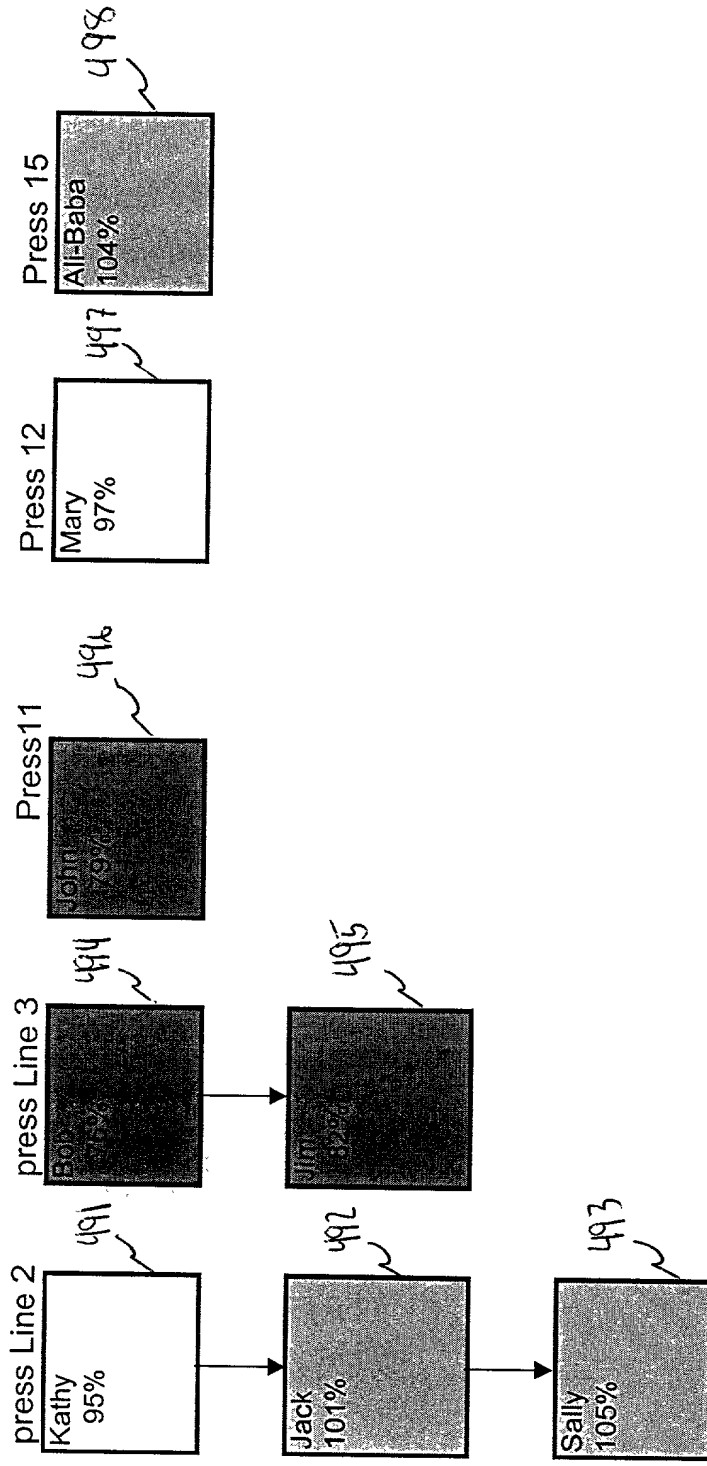


Fig. 16 b

Employees Utilization and Performance Tracking

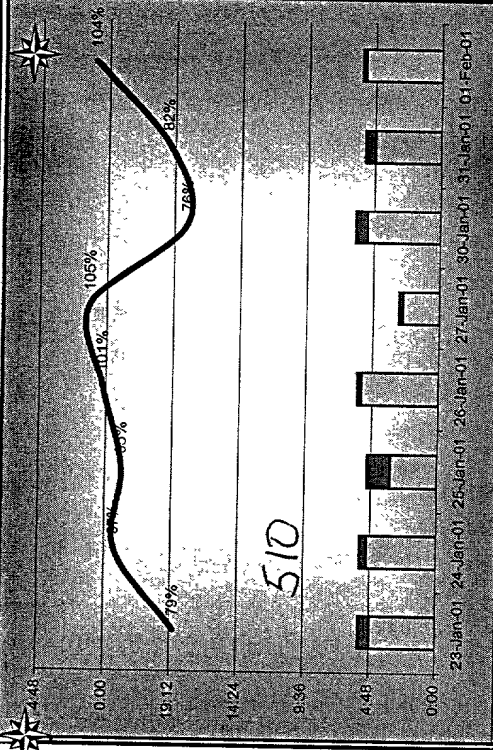
Filt Company Product Employee Period Analysis

507 Employee Mary Period 01/23/01 - 02/04/01

DATE	Post	Total Time	Active time	Inactive time	Efficiency
23-Jan-01	101	5:36	4:46	0:50	79%
24-Jan-01	102	5:34	5:03	0:30	97%
25-Jan-01	103	5:05	3:25	1:39	95%
26-Jan-01	103	5:51	5:35	0:15	101%
27-Jan-01	103	2:55	2:39	0:15	105%
30-Jan-01	105	6:07	5:16	0:50	76%
31-Jan-01	105	5:29	4:48	0:41	82%
01-Feb-01	107	5:44	5:31	0:12	104%
02-Feb-01	102				
03-Feb-01	102				
04-Feb-01	102				

507 503 504 505 506 507

Employee Mary Lee



ID

56787

Name

Mary Lee

Division

Forming

Position

Operator

Description

Needs Close Supervision

Pay Rate

25.65

Date of hire

10/10/1998

Seniority

3

Average Efficiency

92%

515



Fig. 16c

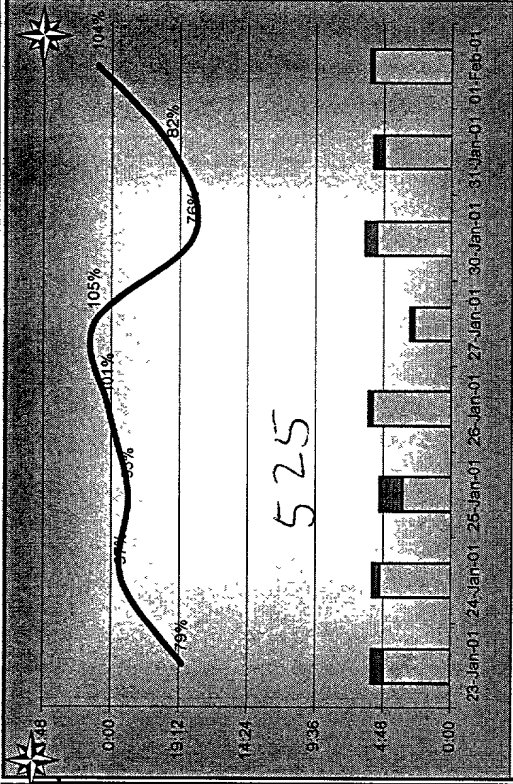
Employees Utilization and Performance Tracking

Company Product Employee Period Analysis

Post 101 Period 01/23/01 - 02/04/01

DATE	Employee	Total Time	Active time	Inactive time	Efficiency
23-Jan-01	John	5:36	4:46	0:50	79%
24-Jan-01	Mary	5:34	5:04	0:30	97%
25-Jan-01	Kathy	5:05	3:26	1:39	95%
26-Jan-01	Jack	5:51	5:36	0:15	101%
27-Jan-01	Sally	2:55	2:40	0:15	105%
30-Jan-01	Bob	6:07	5:17	0:50	76%
31-Jan-01	Jim	5:29	4:48	0:41	82%
01-Feb-01	Ali-Baba	5:44	5:32	0:12	104%
02-Feb-01					
03-Feb-01					
04-Feb-01					

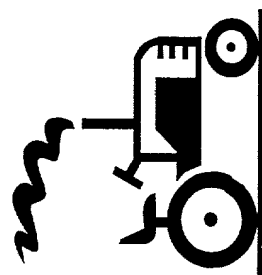
521 ~ 522



F 101

ID 23456

Name Press



Description 200 ton mechanical press

Average Efficiency 92%

527

Fig. 16d

		Date		Shift			
531							
Post ID	Available Time	Down Time		Repair Time		Reaction Time	
		min	%	min	%	min	%
1	480	140	29%	112	23%	28	6%
2	480	53	11%	38	8%	15	3%
3	480	20	4%	18	4%	2	0%
4	480	48	10%	41	9%	7	1%
5	480	6	1%	5	1%	1	0%
6	480	128	27%	101	21%	27	6%
7	480	128	27%	101	21%	27	6%
8	480	12	3%	10	2%	2	0%
9	480	59	12%	44	9%	15	3%
10	480	140	29%	112	23%	28	6%
11	480	53	11%	38	8%	15	3%
12	480	20	4%	18	4%	2	0%
13	480	48	10%	41	9%	7	1%
14	480	6	1%	5	1%	1	0%
15	480	128	27%	101	21%	27	6%
16	480	128	27%	101	21%	27	6%
17	480	12	3%	10	2%	2	0%
18	480	59	12%	44	9%	15	3%
19	480	48	10%	41	9%	7	1%

532

533

534

535

536

537

538

539

532 533 534 535 536 537 538 539

Fig 17a

☐ Down Time
☐ Repair Time
☒ Reaction Time

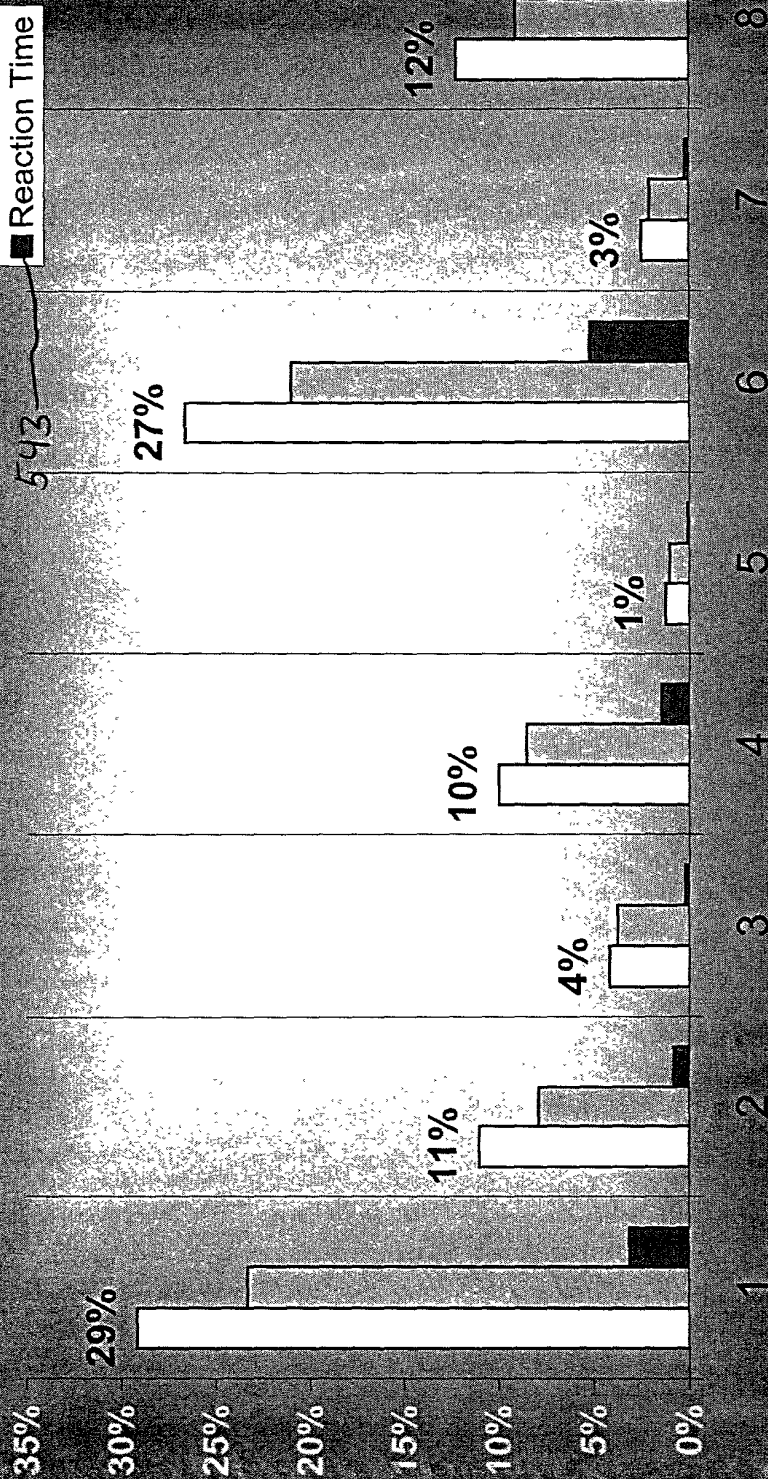


Fig. 17b

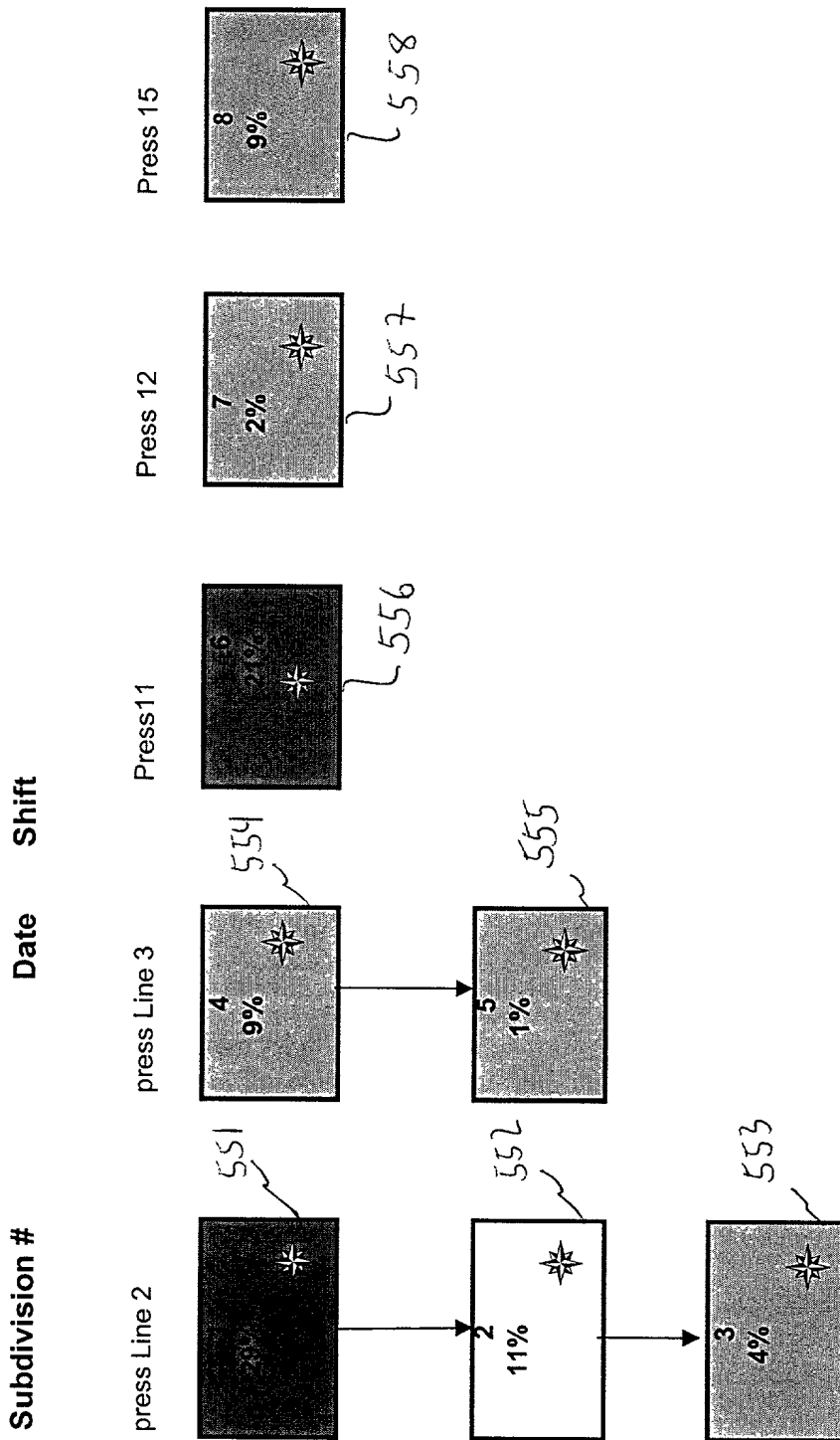


Fig 17c

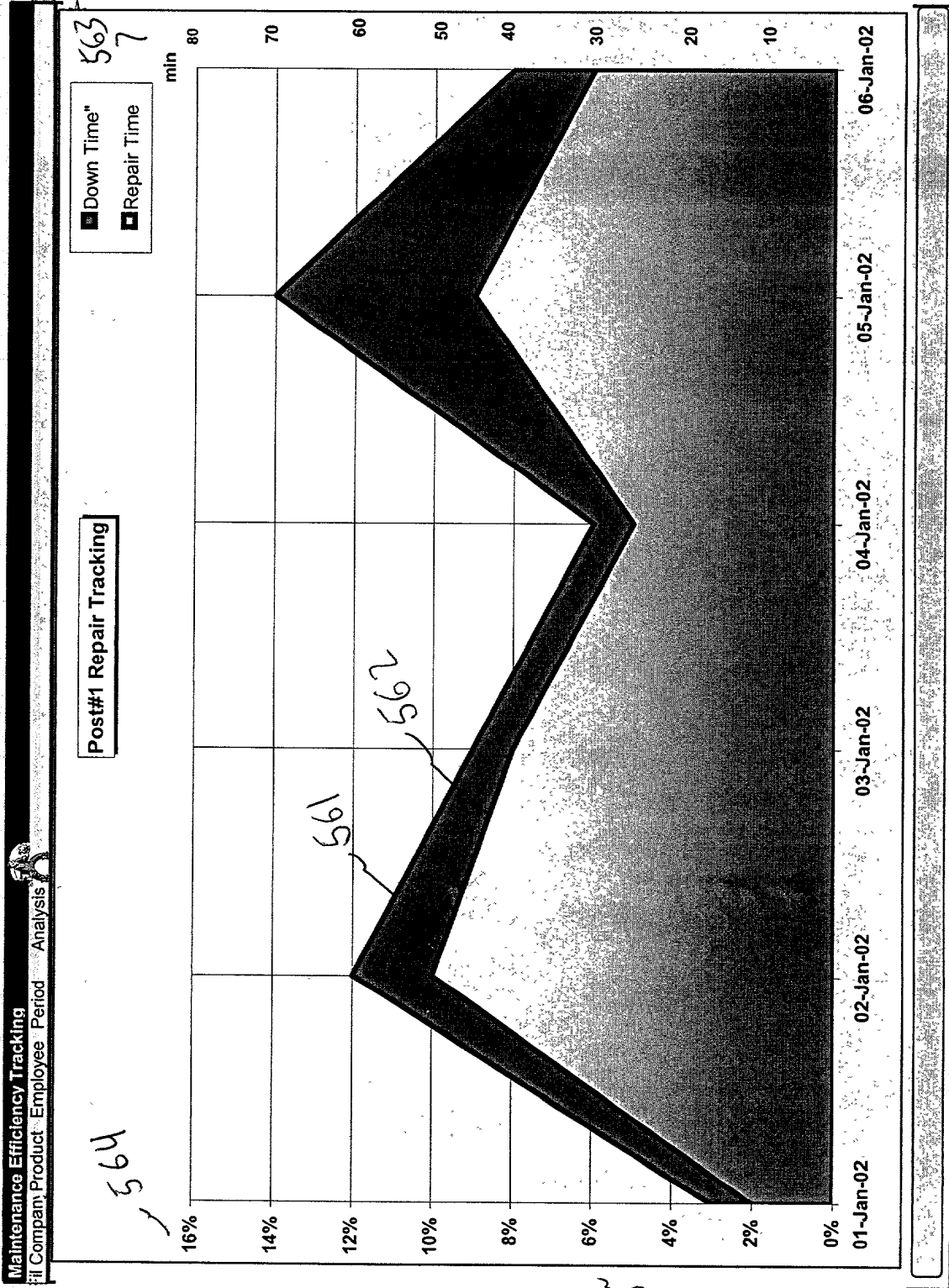


Fig. 17d

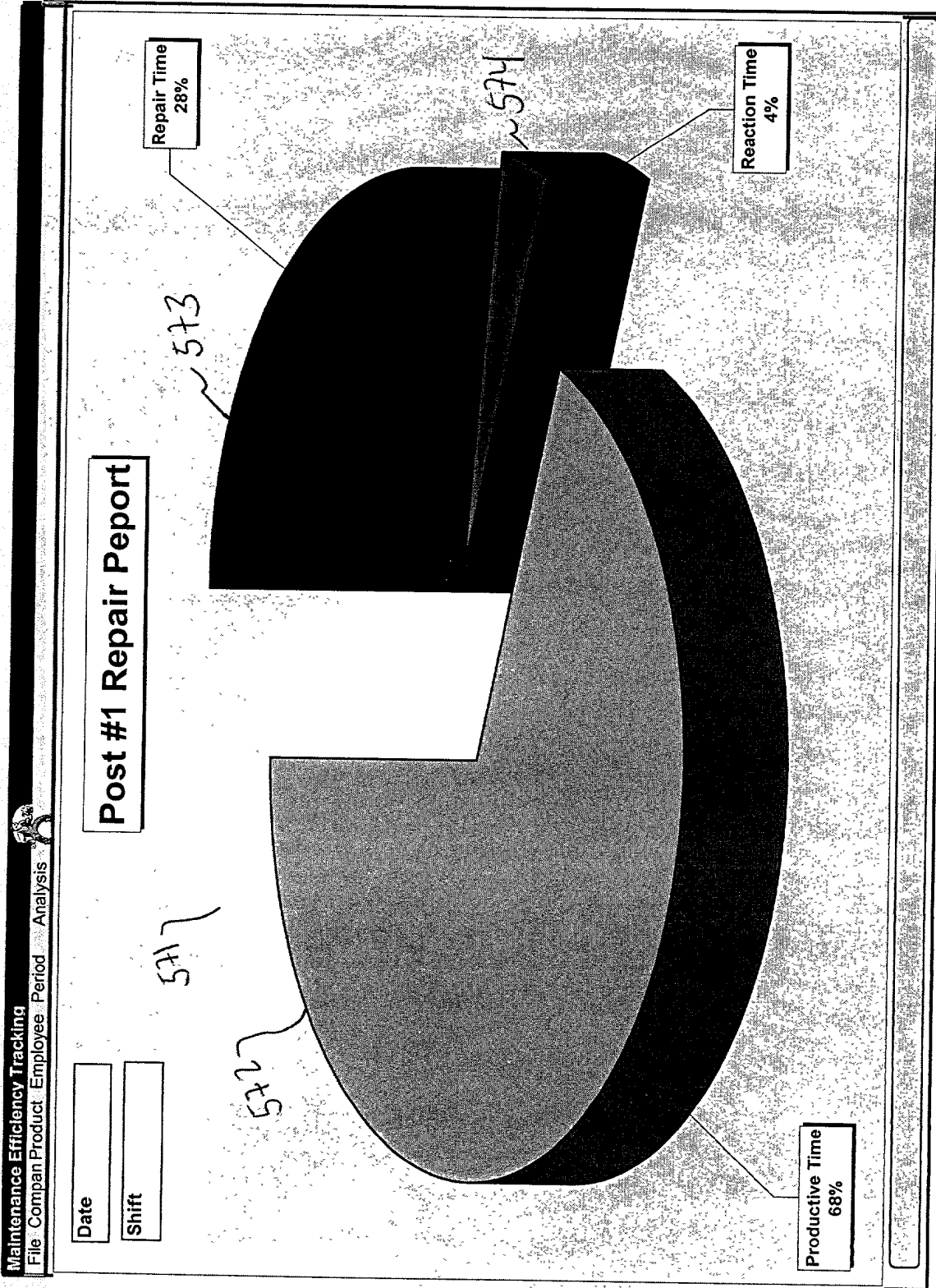


Fig. 17c

Share of Blame														
File Company Product Employee Period Analysis														
Subdivision #														
Date														
Shift														
Post ID	Schedule av. Time	PT Production Run Time	Downtime			Set up time			PMT PM Time	DT Dead Time	Technician			
			DOT No Operator	DMT No Material	DET Machine Failure	DTT Tool Failure	DQT QC Problem	DUT Undefined			STT Tool/Machine	SMT Material	TID Technician ID	TRT
1	200	180	35%	10%	14%	19%	0%	0%	5%	6%	0%	11%		
2	200	165	0%	0%	72%	0%	14%	0%	5%	8%	0%	1%		
3	200	100	1%	21%	0%	0%	0%	0%	12%	9%	0%	57%		
4	200	196	12%	0%	75%	0%	0%	0%	0%	12%	0%	1%		
5	200	125	15%	10%	0%	36%	17%	0%	0%	4%	0%	18%		
6	200	177	3%	25%	14%	0%	0%	45%	0%	5%	5%	3%		
7	200	180	35%	10%	14%	19%	0%	0%	5%	6%	0%	11%		
8	200	165	0%	0%	72%	0%	14%	0%	5%	8%	0%	1%		
9	200	100	1%	21%	0%	0%	0%	0%	12%	9%	0%	57%		
10	200	196	12%	0%	75%	0%	0%	0%	0%	12%	0%	1%		
11	200	125	15%	10%	0%	36%	17%	0%	0%	4%	0%	18%		
12	200	177	3%	25%	14%	0%	0%	45%	0%	5%	5%	3%		
13	200	180	35%	10%	14%	19%	0%	0%	5%	6%	0%	11%		
14	200	165	0%	0%	72%	0%	14%	0%	5%	8%	0%	1%		
15	200	100	1%	21%	0%	0%	0%	0%	12%	9%	0%	57%		
16	200	196	12%	0%	75%	0%	0%	0%	0%	12%	0%	1%		
17	200	125	15%	10%	0%	36%	17%	0%	0%	4%	0%	18%		
18	200	177	3%	25%	14%	0%	0%	45%	0%	5%	5%	3%		
19	200	180	35%	10%	14%	19%	0%	0%	5%	6%	0%	11%		
20	200	165	0%	0%	72%	0%	14%	0%	5%	8%	0%	1%		
21	200	100	1%	21%	0%	0%	0%	0%	12%	9%	0%	57%		
22	200	196	12%	0%	75%	0%	0%	0%	0%	12%	0%	1%		
23	200	125	15%	10%	0%	36%	17%	0%	0%	4%	0%	18%		
24	200	177	3%	25%	14%	0%	0%	45%	0%	5%	5%	3%		
25	200	180	35%	10%	14%	19%	0%	0%	5%	6%	0%	11%		
26	200	165	0%	0%	72%	0%	14%	0%	5%	8%	0%	1%		
27	200	100	1%	21%	0%	0%	0%	0%	12%	9%	0%	57%		
28	200	196	12%	0%	75%	0%	0%	0%	0%	12%	0%	1%		
29	200	125	15%	10%	0%	36%	17%	0%	0%	4%	0%	18%		
30	200	177	3%	25%	14%	0%	0%	45%	0%	5%	5%	3%		
L501 L502 L503 L504 L505 L506 L507 L508 L509 L510 L511 L512 L513														

Fig. 18a

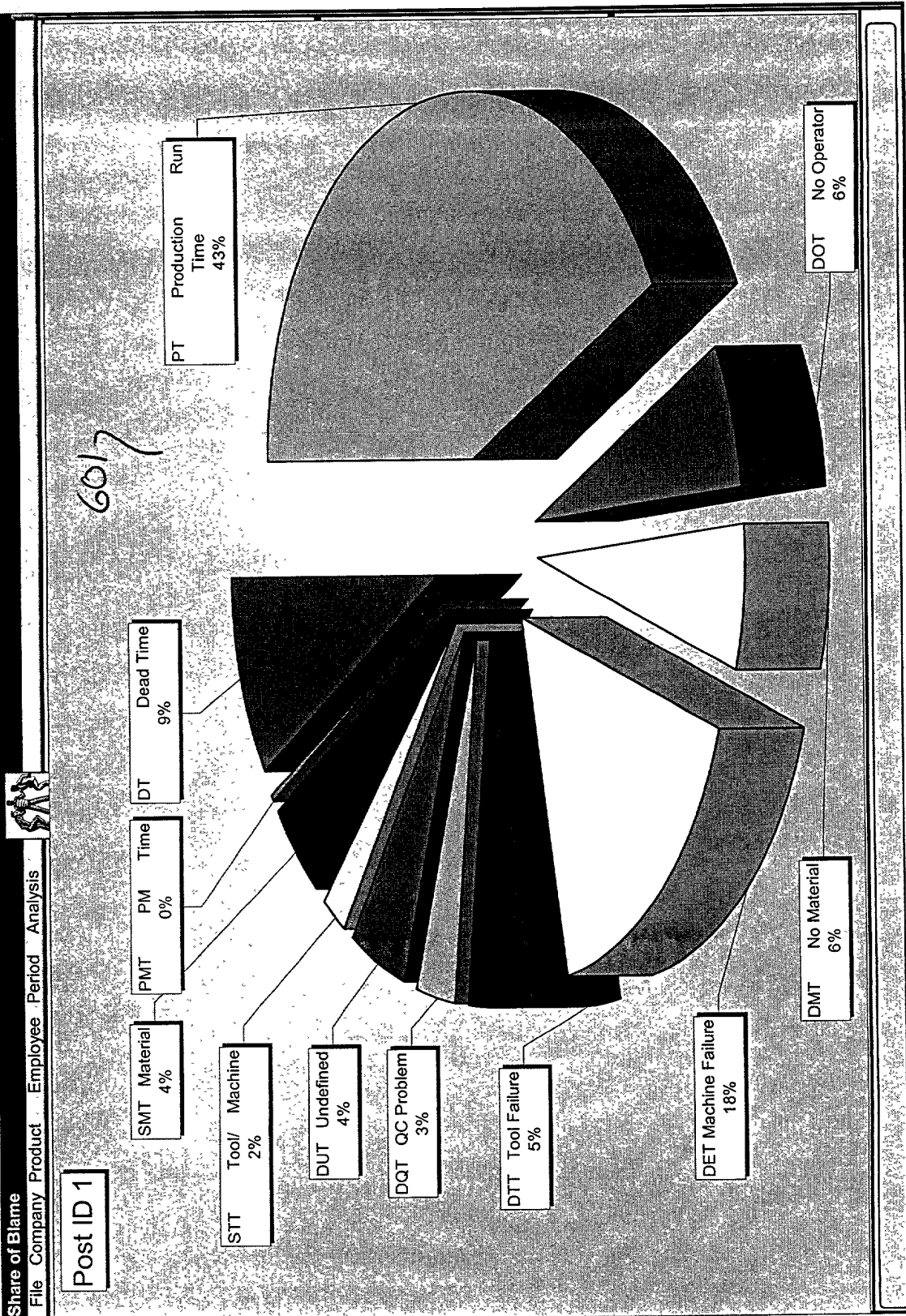
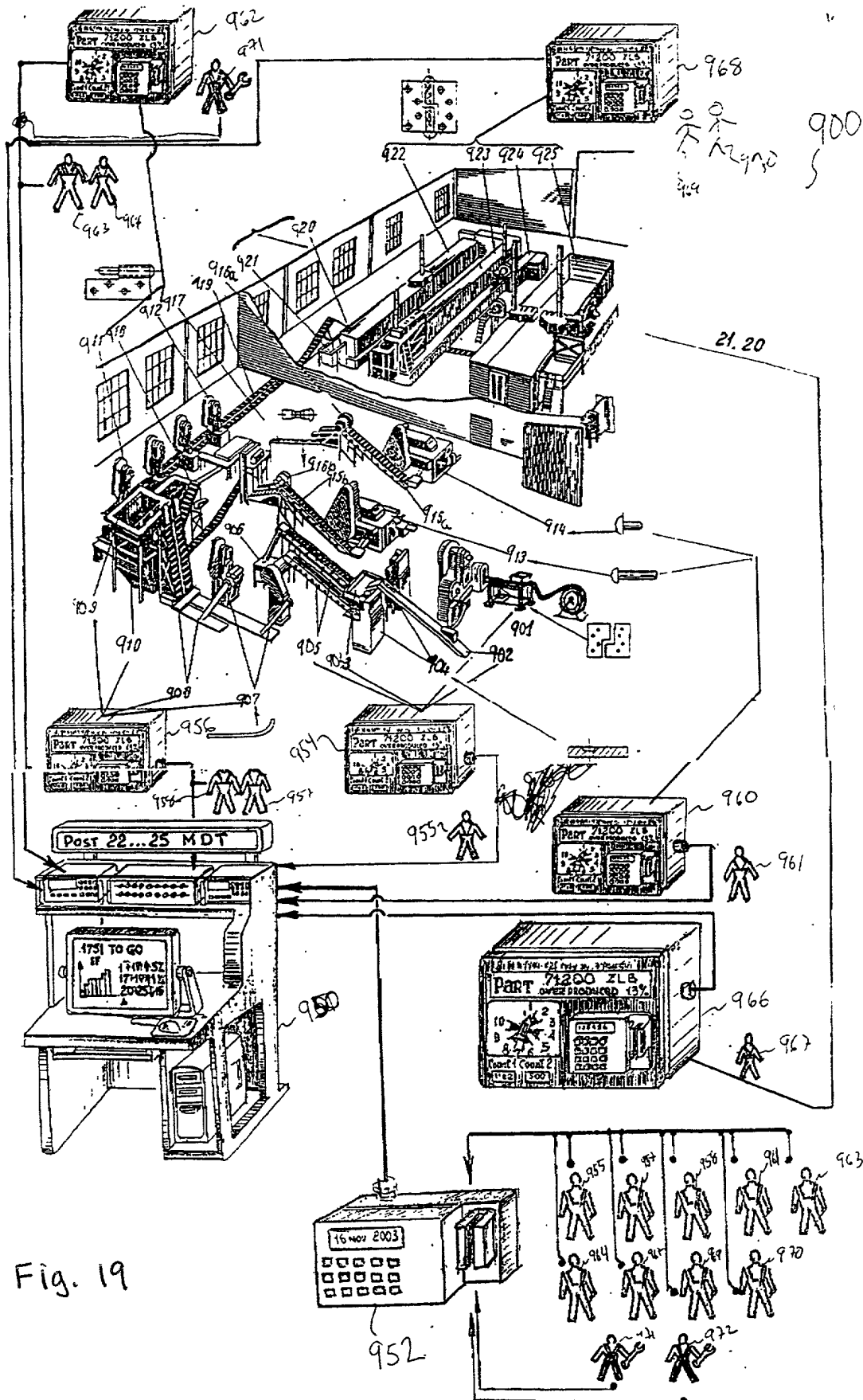


Fig. 18b



1000 **Method of Calculating Production Cost and Efficiency**

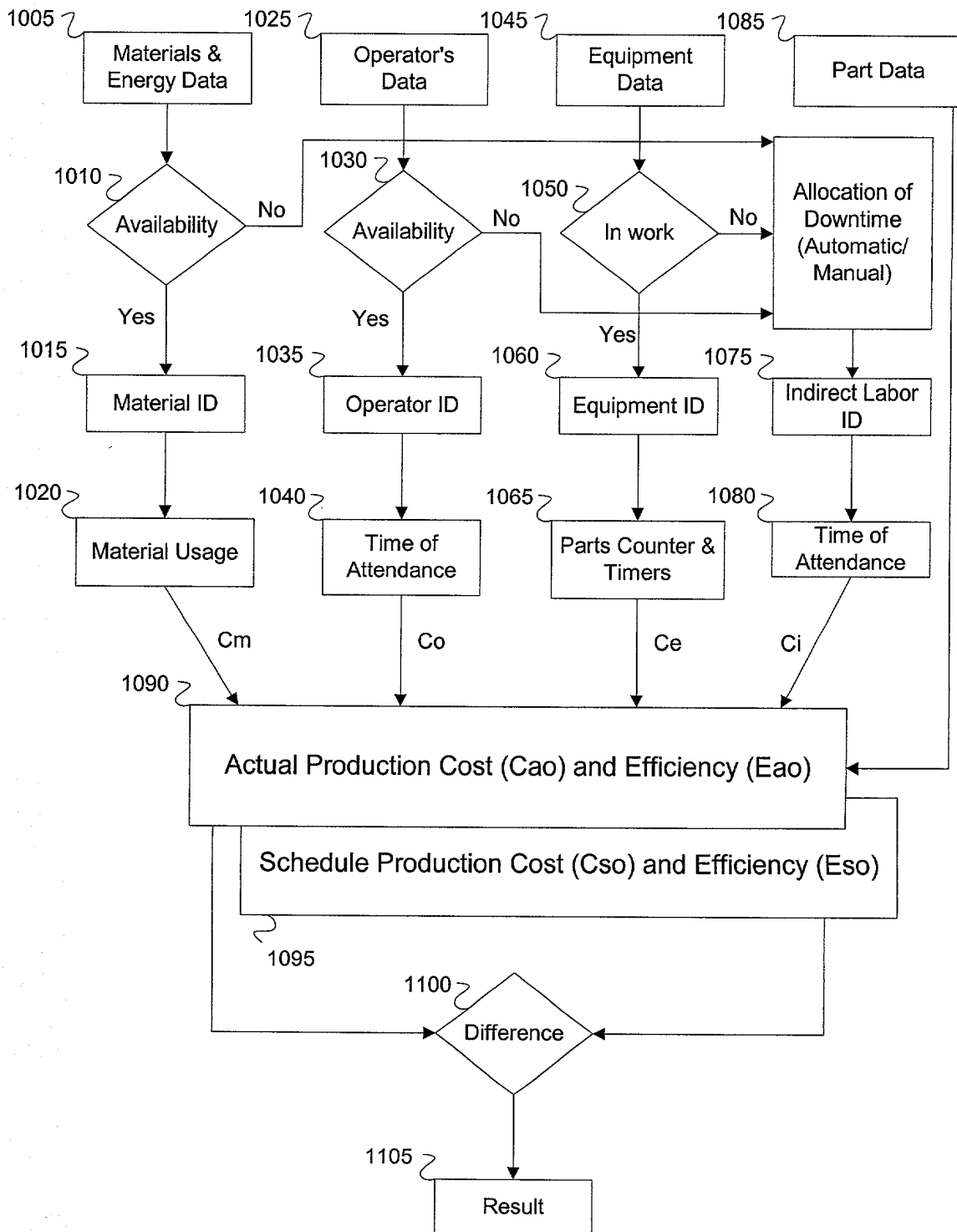


Fig. 20